WARFIGHTER READINESS RESEARCH OVERVIEW

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Air Force Research Laboratory
Air Force Materiel Command

Report Documentation Page

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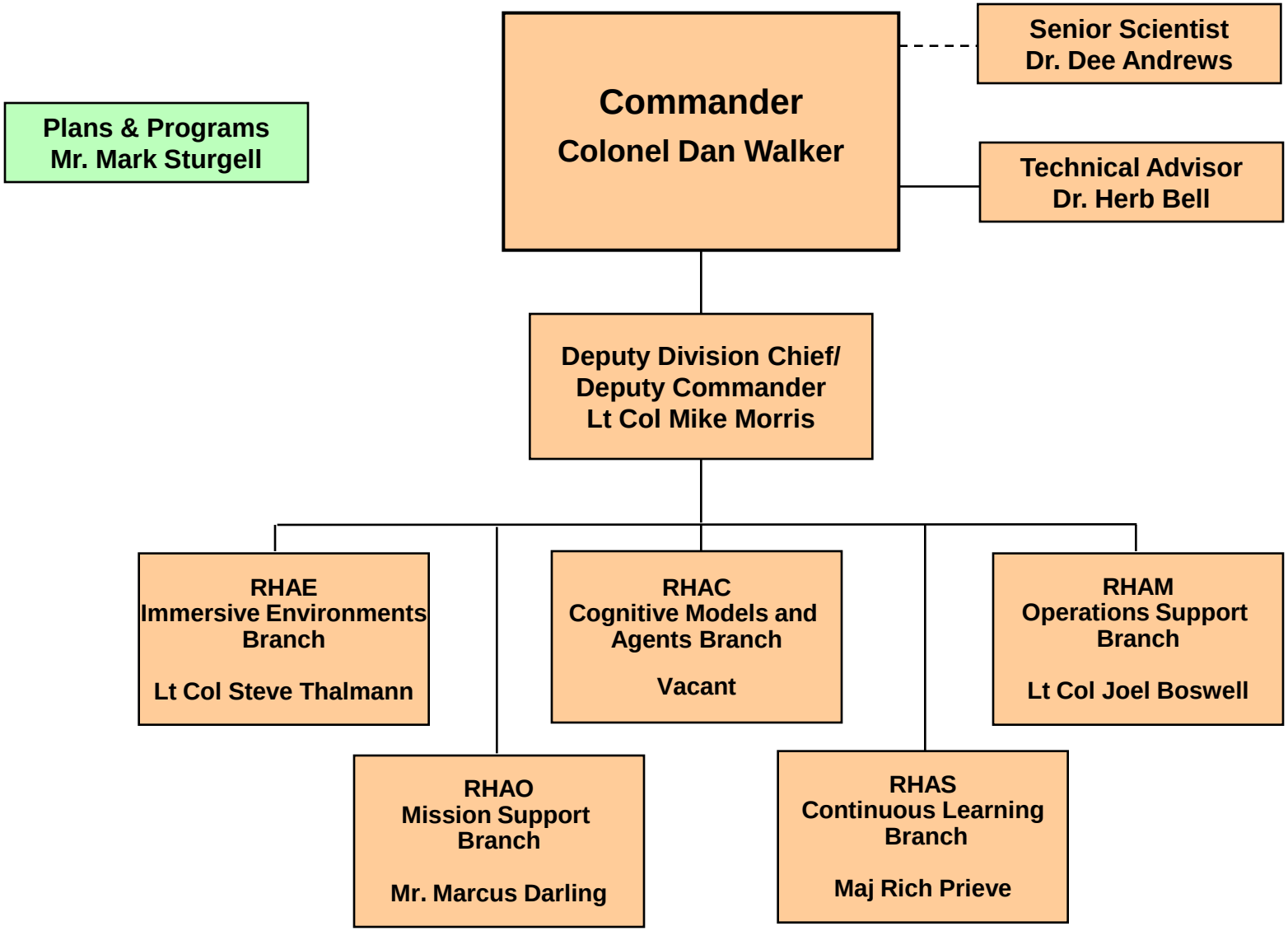
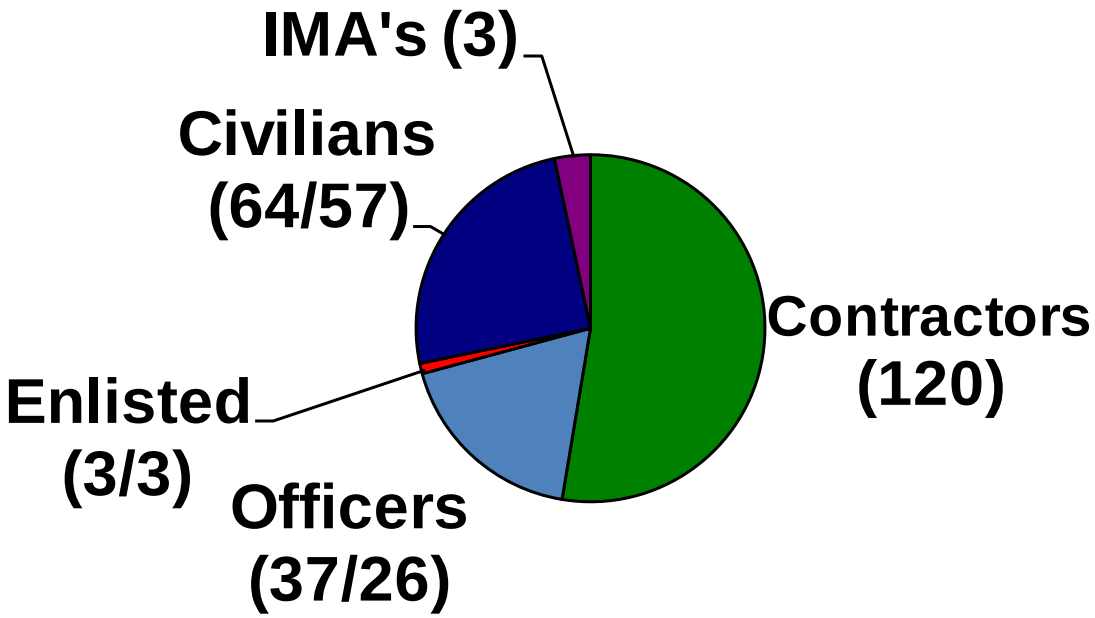
Overview

- Mission
- Organization
- Collaborators
- Research
- BRAC
- On The Horizon

Warfighter Readiness Research Division



711 HPW/RHA Workforce Demographics



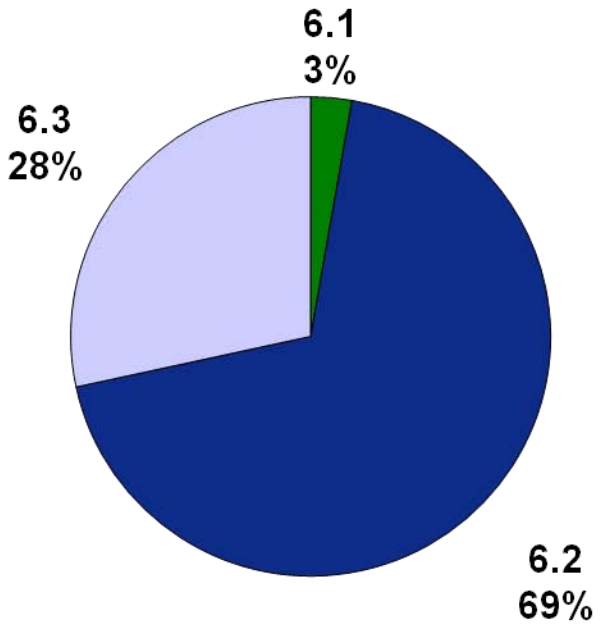
Mesa

104 Gov't /120 Ktr

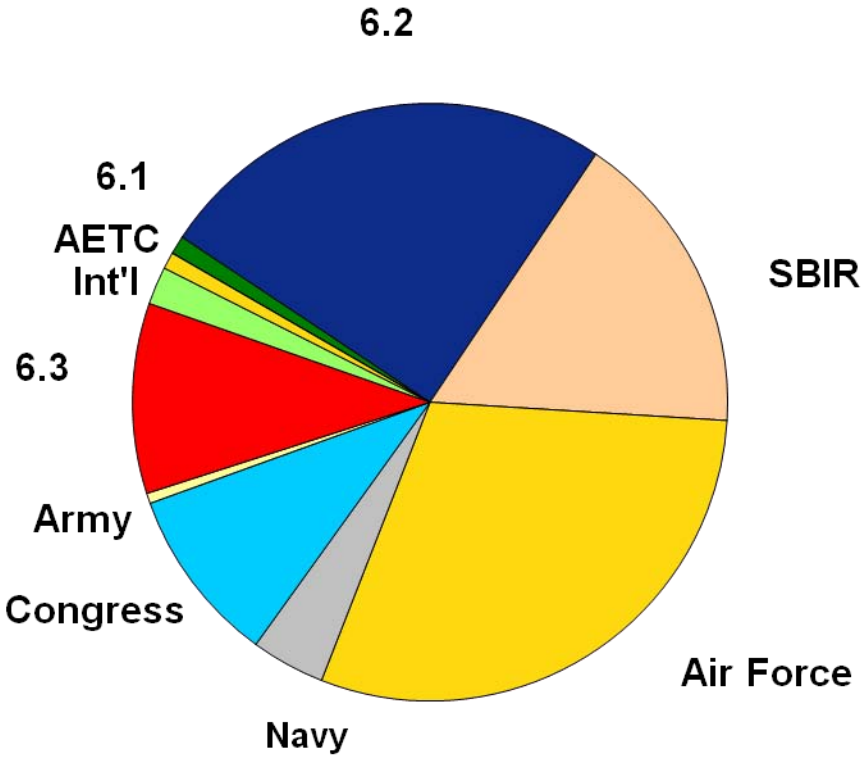
Gov't Employees Legend (#assigned/# auth) as of Feb 09

FY09 Funding

S&T Base Funding
$21.3M



Total Funding Leveraged
$58.6M
(Projected)



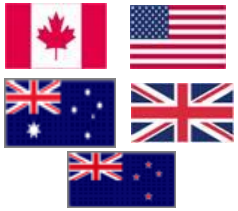
As of: Feb 2009

Government Collaborators

AF Agency Collaboration

Other Agency Collaboration

International Collaboration



Growing Extramural Collaborators and Linkages

Vision & Mission Statements

AFMC Vision

AFRL Vision

711 HPW/RH Vision

Decision Dominance

Anticipate-Influence-Affect-Survive.

711 HPW/RH Mission

Lead revolutionary S&T for superior airman cognition, readiness, performance, and survival

- **Decision Making**
- **Forecasting**
- **Performance**
- **Training**

Warfighter Readiness Research Division

Research, demonstrate and transition human performance methods and technology to enable the right people to have the right skills, knowledge, experience and capabilities at the right time to make the right decisions

Dominate the Decision Environment

Why Are We Here?
S&T Challenges

- **Develop experiential decision environments that... provide effective, on-demand learning, training, rehearsal and decision dominance**
- **Operational readiness through ...realistic immersive training environments**
- **Options for individual, collective, and joint training**
  - **base training decisions on training effectiveness evaluations**
  - **maximize use of new learning techniques, simulation technology, embedded training**
  - **anytime, anyplace training, rehearsal and decision dominance**
  - **maintain skill proficiencies, and reduce individual and collective training costs, time and resources**

Mission Effective Performance
Core Technology Areas of Research

Immersive Environments

Live, Virtual and Constructive Modeling and Simulation

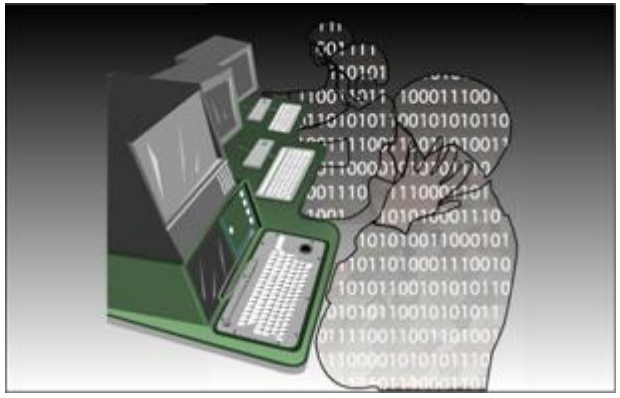
Immersive Technologies

Continuous Learning

LVC Training and Aiding Methods

Performance Measurement and Tracking

Cognitive Modeling



Computational Replicates

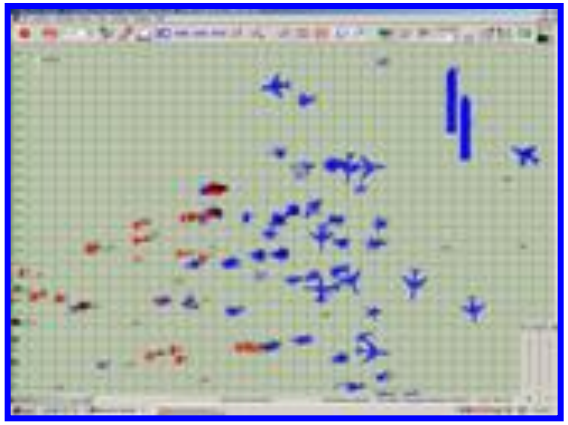
Our Approach

Optimize readiness training and rehearsal experiences by providing scientifically-based advanced distributed simulation capability incorporating *live*, *virtual*, and *constructive* players

Live

Virtual

Constructive



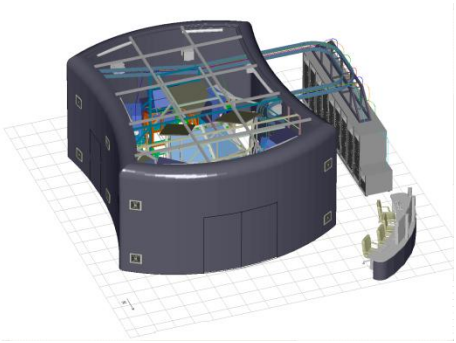
Core Processes

Achieve S&T Vision

- DMO to Decision Environments
- FLTC 1 Anticipatory C2I
- FLTC 8 Affordable Mission Generation and Sustainment

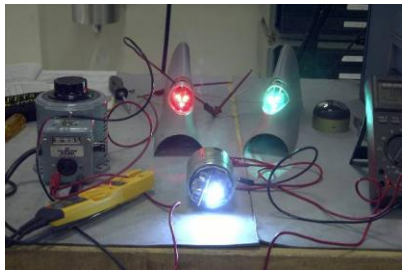
Transition to Acquisition Programs

- WRAPMTS ATD
- 20/20 ATD
- JTAC-VT HVP
- TSPG Membership



Rapid Response and Tech Support

- UAS Performance-based training
- M2ESA Lights
- Support to AFSO21

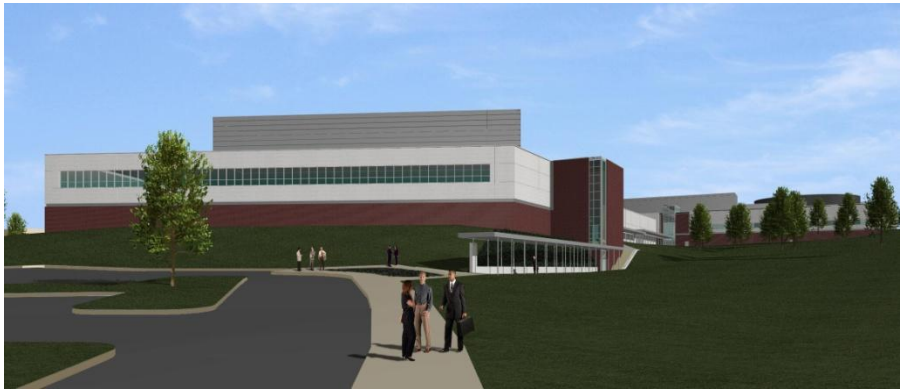


Mission Effective Performance
Relocation in 2011

2009

- Move Mission Effective Performance laboratories
  - 45,000 square feet of lab space
  - Flexible design
- Consolidate division scientists and engineers in single building
- Integrate with other on-base laboratories

2011



Wing Scheduled Phased Moves

- **Apr 2010 - 711 HPW/RHP, 711 HPW/RHX**
- **Jun 2010 - 711 HPW/RHA, USAFSAM/ET and OE**
- **Sep 2010 – USAFSAM/ED**
- **Oct 2010 – USAFSAM/PH**
- **Jan 2011 – USAFSAM/FE**
- **May 2011 – 711 HPW/HP**

(15 Sep 2011 - BRAC Implementation Deadline)

Recent S&T Contributions to Ops

- **Proficiency Based Ready Aircrew Training Program (P-RAP) – ACC-requested field studies to implement performance assessment and to validate mixes of live and virtual training for ops**
- **F-35 Visualization and Evaluation - Support ACC/A8 to develop alternative solution for HMD integration into F-35 FMS**
- **NASA OBVA - Support USAF/SAM in development of eye-limited simulation laboratory to enable validation of pilot vision standards**
- **Thumbprint Surveys - CSAF tasker – Worldwide data collection from ops to better define mixes of live and virtual training**
- **Unmanned Aerial Systems - CSAF tasker - Improve quality and assessment of UAS training and operations**
- **Standard Space Trainer (SST) - AFSPC-sponsored common adaptive learning and simulation capabilities for multiple space systems**
- **Navy Maritime Operations Center (MOC) – CNO-requested mission essential competency support to define training requirements and gaps**

Science & Technology For Training and Logistics Transformation

SCHEDULE:
BAA Announcement: Dec 2004 (BAA 05-04 HE)
Receive Proposals: Open through 31 Dec 2009
Number of Awards: TBD

Contract Type: Cost Plus Fixed Fee or Cost (no fee)/ Cooperative Agreements or Grants
Ceiling ($M): $34.9
Acquisition POC: Jay Carroll (711HPW/RHA)
480-988-6561 x148
jay.carroll@mesa.afmc.af.mil

Description

Research, develop, demonstrate, evaluate, and transition leading edge technologies and methods to train warfighters and optimize human-centered logistics processes, enabling the expeditionary aerospace force.

Technologies

- Models of human learning and effectiveness
- DMO performance measurement & assessment
- C4ISR live/simulation linkage and recovery
- Distributed event integration & management
- Integrated Portable Human Computer Interfaces

Benefits to the Warfighter

- Immersive, theater level, integrated training and rehearsal systems
- Mission rehearsal based on rapid integration of tactical information
- Theater-level performance measurement & assessment
- Reduced cost and overhead associated with DMO training & rehearsal
- Reduced footprint and more efficient reachback
- More efficient logistics operations
  - -Faster planning/replanning
  - -Less manpower & quicker deployment response

Warfighter Readiness Training Research Contract

Contract Type: CPFF, IDIQ, Multiple Delivery Orders
Period of Performance: July 2005 – Jan 2012
Ceiling: $300M
Place of Performance: Mesa, Arizona (www.mesa.afmc.af.mil)
WPAFB, OH (www.wpafb.af.mil) – after Summer 2010

POC: Jay Carroll (711HPW/RHA)
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jay.carroll@mesa.afmc.af.mil

Description

On-demand integration of live, virtual, and constructive systems to immerse the warfighter in realistic operational environments

Technologies

- Rapid database and scenario development
- Models of human learning and effectiveness
- DMO performance measurement & assessment
- C4ISR live/simulation linkage and recovery
- Distributed event integration & management
- Distributed system reliability & security

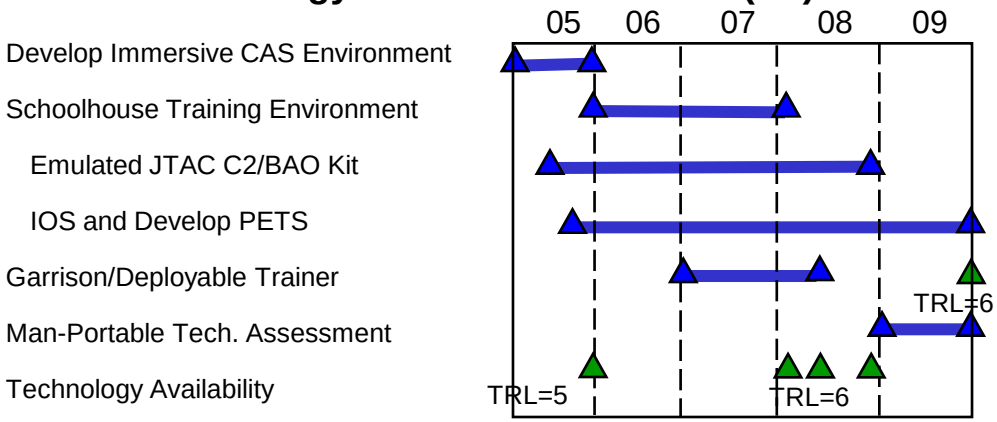
Benefits to the Warfighter

- Immersive, theater level, integrated training and rehearsal systems
- Mission rehearsal based on rapid integration of tactical information
- Theater-level performance measurement & assessment
- Enhanced training realism
- Reduced cost and overhead associated with DMO training & rehearsal
- Reduced footprint and more efficient reachback

Joint Terminal Attack Control Training and Rehearsal System

711HPW/RHAE

Technology Investment Schedule (FY)



Description

- Research effort to close technology gaps in Close Air Support (CAS) / Special Tactics training and rehearsal capabilities

Technology

- Study impact of immersive CAS simulation
- High fidelity, realistic visualization with sensor, simulator and database correlation
- Enhance CGF enabling technologies for CAS
- Fully functional emulated JTAC C2 Kit devices
- Research and assess HMD CAS applications

Benefits to the Warfighter

- Simulation and visualization for Joint Terminal Attack Control and Special Tactics
- Unique tool for evaluating MR status of operators, tactics feasibility and CONOPS
- Reduced operational risk due to OJT
- Provide After Action Review (AAR) feedback; reduce learning curve; augment live fly AC
- Just-in-time proficiency training and rehearsal development capability
- Realistic, on-call, training and rehearsal with JTAC C2 Tool Kit equipment

Computer Generated Forces (CGF); Head Mounted Display (HMD); Aircraft (AC)

Mission Ready (MR); On-the-Job Training (OJT); Close Air Support (CAS)

Deployable Distributed Mission Operations (DMO)

711 HPW/RHA

Technology Investment Schedule (FY)

	05	06	07	08	09	10
Spiral 1: Desktop testbed and syllabus dev						
- Prelim fidelity reqs			▲			
- Multi-mission scenarios and tools			▲			
Spiral 2: Learner models, meas						
- Training/AAR mgt tools				▲		
Spiral 3: Reconfig mission task demo						
- Day/Night database and visuals				▲		
Spiral 4: Deployed DMO Demo						
- Effectiveness assessment					▲	
- Final fidelity reqs					▲	
Tech Availability				5	5	6

Description

- Mission and fidelity reconfigurable integrated suite for distributed tactical training, rehearsal, and exercise

Technologies

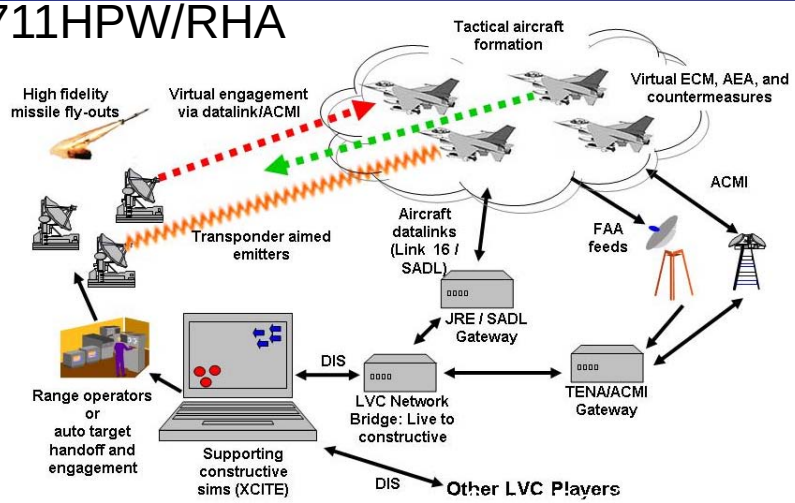
- Mission-task level fidelity requirements
- Reconfigurable architecture to support diverse DMO training and rehearsal events
- Agent-enabled syllabus authoring methods
- Simulation/instruction management tools
- Interactive after-action-review/debrief tools

Benefits to the Warfighter

- Deployable and reconfigurable simulation environment with DMO reachback capability
- Flexible, individualized training environment
- Enhanced management and learning focus of rehearsal and exercise events
- Performance-based, tactically relevant training and rehearsal fidelity trade-offs
- Leverages compact immersive visual environment CE technologies
- Quantified fidelity levels for mission training and rehearsal for operational units

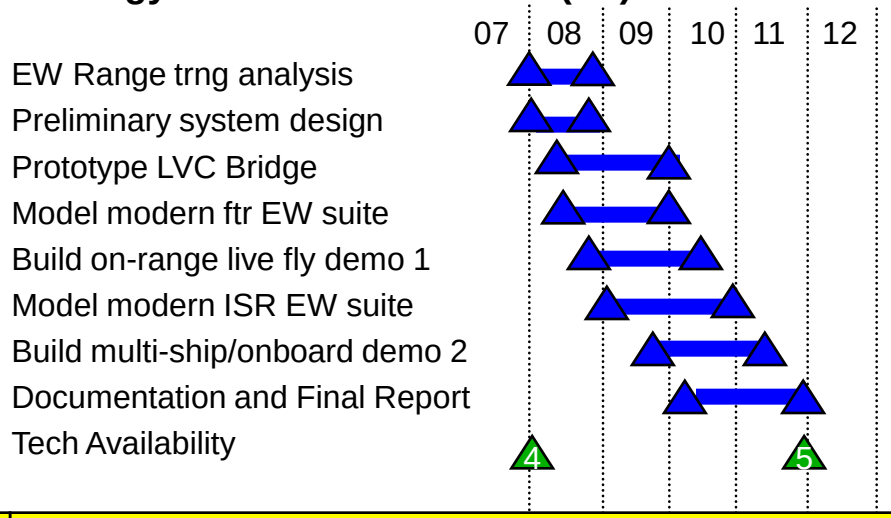
Networked LVC Electronic Warfare Training

711HPW/RHA



LVC EW Training Operational Concept

Technology Investment Schedule (FY)



Description

- LVC Technologies for interactive team EW training against validated, robust, modern threats … any time, in any airspace

Technology

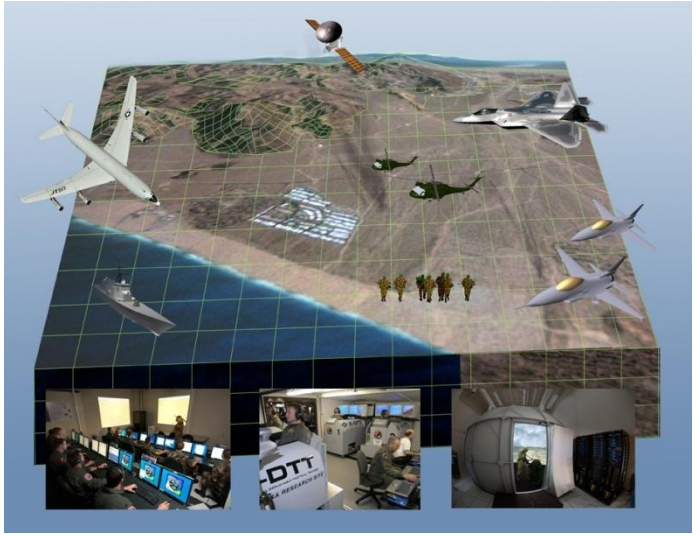
- High refresh rate, network supported LVC
- Implement predictive algorithms for live feeds to high refresh rate simulations
- Measure training effects on live range

Benefits to the War Fighter

- Denser, more realistic EW threats for advanced platform and ISR training
- Increase utility of legacy range emitters
- Integrate “low cost” part-task emitters
- Provide robust IADS for LVC ranges using validated DMO technologies
- Automated Range Training Officer
- Range MLS capability

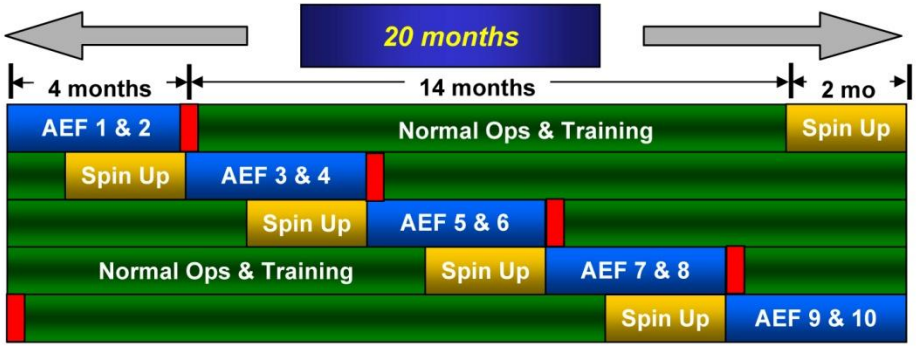
Where We Are Going?

AUTOMATED SYSTEMS TAILOR SCENARIOS BASED UPON INDIVIDUAL PROFICIENCY



EMBEDDED INTELLIGENT TUTORS COACH STUDENTS

EMBEDDED AGENTS ASSESS PERFORMANCE



~25,000 personnel
2 - 3 Combat Wings (Fighters / Bombers)
2 ½ Mobility Wings (Tankers / Airlift)

Typical Total Force AEF
1 – 2 ISR Squadrons
3 - 4 Austere locations & AFSOC base

AEF SPIN-UP AND RECONSTITUTION

Learning Management Tech for Distributed Mission Operations

(Planned New Start)

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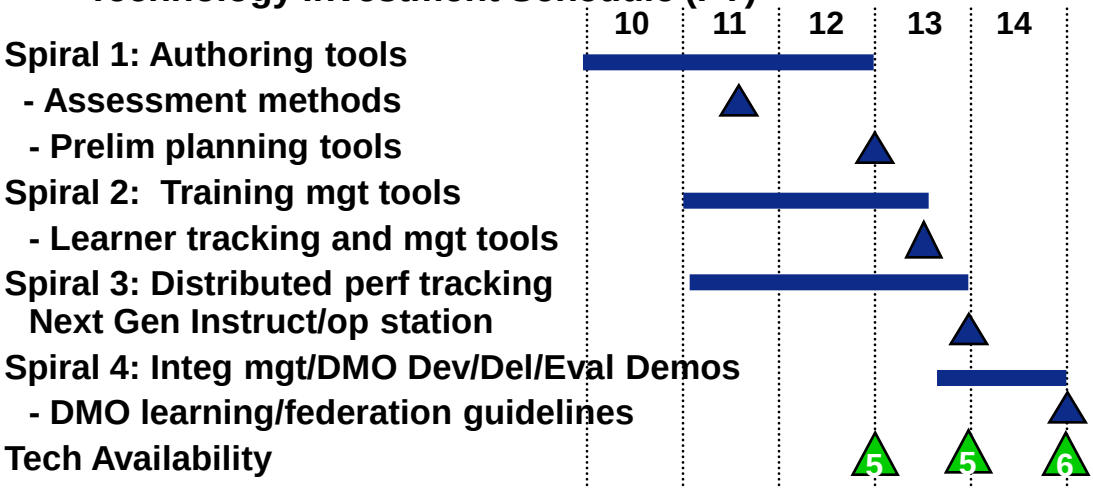
Technology Investment Schedule (FY)



Description

- An interactive toolset incorporating event planning, instructional design and scenario authoring capabilities along with performance measurement methods for DMO

Technologies

- Event and mission planning tools
- Coach-enabled scenario authoring
- Interactive syllabus development methods
- Automated instructional delivery and management
- Interactive after-action review/debrief tools

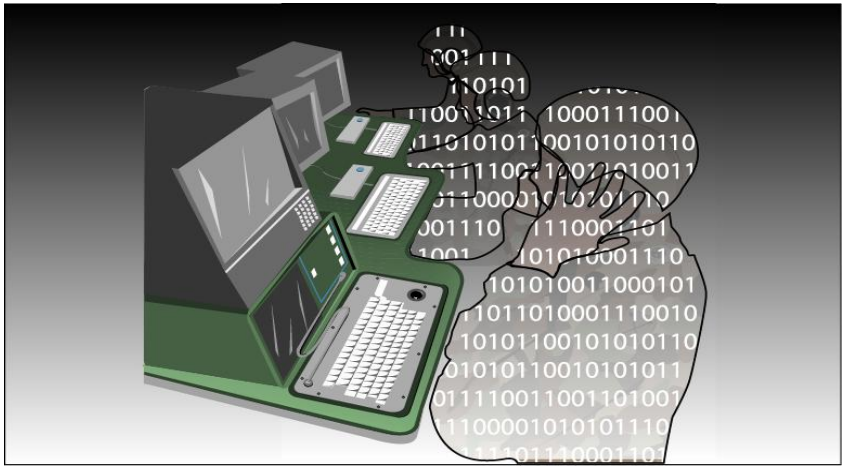
Benefits to the Warfighter

- Instructionally-rich local and distributed training and rehearsal
- Individualized training environment
- First-order management and learning enhancements to rehearsal and exercise events
- Performance-based training and rehearsal design, delivery and evaluation
- Continuous training and rehearsal tracking and proficiency enhancement

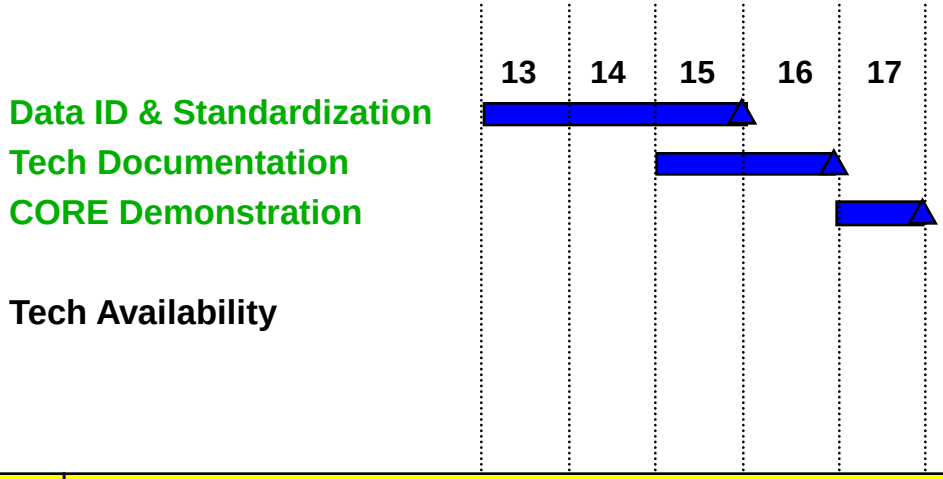
Expert Computational Cognitive Models for C2

(Proposed New Start)

711 HPW/RHAC



Technology Investment Schedule (FY)



Description

Demonstrate the technology to rapidly develop and validate multiple computational replicates (COREs) to serve as synthetic teammates in a C2I training and rehearsal environment.

Technology

- Automated encoding of knowledge bases
- Semi-automated infrastructure for CORE development and validation

Benefits to the Warfighter

- 90% reduction in time and cost to develop psychologically valid computational cognitive process models for training applications in complex, relevant environments
- Greater availability of flexible, realistic training with constructive entities

Shareable Authoring, Assessment, Adaptation for Decision Making Teams in LVC Ops

(Proposed New Start)

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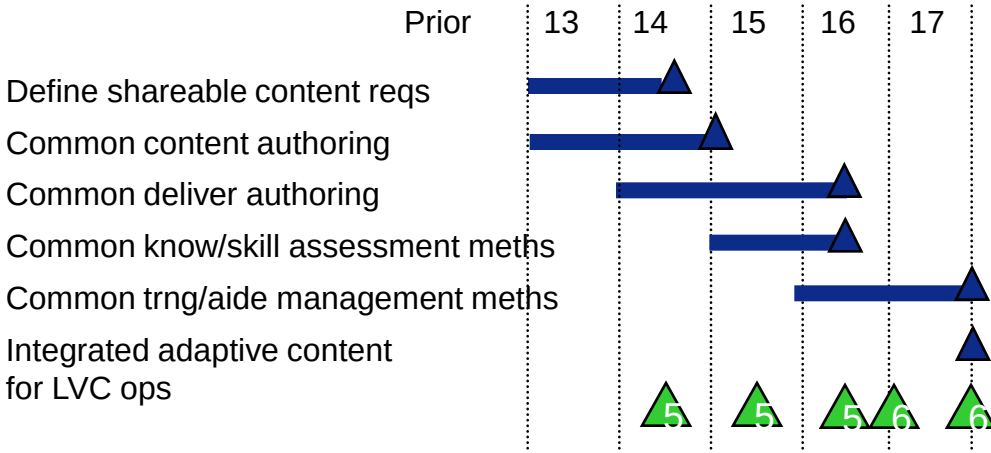
Technology Investment Schedule (FY)



Description

Develop shareable scenario authoring, knowledge management and assessment, and dynamic adaptation methods and data for large teams in LVC decision environments

Technology

- Common content authoring SCORM, HLA, DIS, TENA
- Content tagging and mgt across architectures
- ICD for scenario authoring and sharing
- Common metrics authoring, indexing, warehousing
- Design interface spec for content mgt and delivery
- Exemplar integrated and adaptive methods

Benefits to the Warfighter

- Common content and requirements across multiple LVC architectures/environments
- Common design, assess, manage, and report content/outcomes for team of team events
- Reusable/derisked training, rehearsal, aiding strategies, scenarios, and metrics for global LVC ops
- Validated scenarios, and metrics across architectures
- Continuum of training and ops exemplar
- LVC content reference modules

Gaming for Training in Complex Domains

(Proposed New Start)

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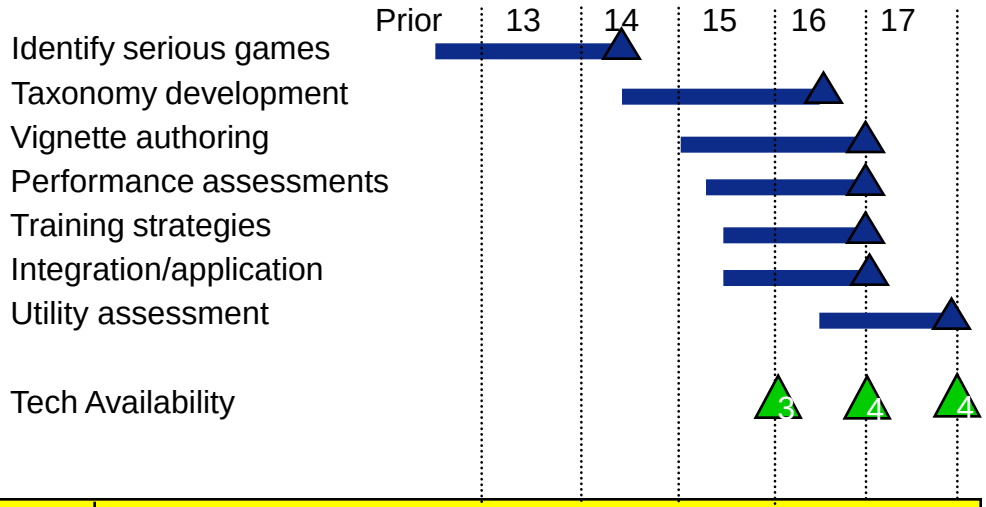
Technology Investment Schedule (FY)



Description

- Develop, demonstrate, and evaluate utility of game-based methods for individual and team training in complex decision making domains. Identify gaming features that promote learning

Technology

- Game-based methods and techs:
  - Scenario development
  - Performance assessment/tracking
  - Data archiving and retrieval
  - Intelligent tutoring/coaching
  - Links into more robust military environments

Benefits to the Warfighter

- Taxonomy and guidelines for adapting game technology for training applications
- Leverages game developer investment guided to valid instructional strategies requirements
- Game-based approaches as supplements to live, virtual, and constructive operations
- Training environments with the engaging qualities of a game and the instructional rigor of an intelligent tutoring system


Warfighter Readiness Research Division
Air Force Research Laboratory

Questions?